teacher pre-visit packet

water

Exhibit Highlights

water, the University of Montana spectrUM Discovery Area's newest traveling exhibit, inspires learners of all ages to explore water and ecosystem sciences. Through interactive exhibits and activities, Water highlights the research of the Institute on Ecosystems by encouraging students to explore large river ecosystems and the effects of water on Montana's landscapes.

Visitor to Water will explore ecosystem sciences through exhibits including a Virtual Sandbox Table, a larger-than-life Erosion Table to explore how rivers form, and a Non-Point Source Pollution table to explore the effects that humans have on the landscape.

Participate in guided activities with a Groundwater Model, and use hand-held microscopes to see macro- and micro-invertebrates in Montana's rivers. These and many more exciting experiences await you and your students at Water.

To bring Water to your school, call 728-7836.

To bring **water** to your school, call 243-4828.

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Overview of Montana State Standards and Next Generation Science Standards applied in **water** field trips.

Montana OPI State Standards

Science Standard 3: Humans and Science

Students will demonstrate knowledge of human health and the history and development of science, as well as make informed decisions concerning human impact upon the earth.

Science Standard 4: Physical Science

Students will demonstrate knowledge of properties, forms, patterns, changes, and interactions of physical and chemical systems.

Science Standard 5: Life Science

Students will demonstrate knowledge of characteristics, structures, and functions of life systems; the process, continuity, and diversity of life; and the interactions of organisms with each other and their environment.

Science Standard 6: Earth and Space Science

Students will demonstrate knowledge of the composition, structures, processes, ad interactions of the earth-space systems.

Science Standard 3

Students, through the inquiry process, demonstrate knowledge of characteristics, structures, and function of living things.

Science Standard 5

Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

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Next Generation Science Standards

Life Science 1: From Molecules to Organisms: Structures and Processes

- K-LS1-1: Use observations to describe the patterns of what plants and animals (including humans) need to survive.

Life Science 2: Ecosystems: Interactions, Energy, and Dynamics

- 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Life Science 3: Heredity: Inheritance and Variation of Traits

- 1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
- 3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

Life Science 4: Biological Evolution: Unity and Diversity

- 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.
- 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Earth and Space Science 1: Earth's Place in the Universe

- 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
- 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support and explanation for changes in a landscape over time.

Earth and Space Science 2: Earth's System

- 2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- 2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- 2-ESS2-3: Obtain information to identify where water is found on Earth and that it can be solid or liquid.
- 3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.
- 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- 4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

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Earth and Space Science 3:
Earth and Human Activity

K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Key Concepts Explored in **Water**

- The process of erosion shapes the landscape over long periods of time.
- Water transports contaminants through the landscape, both above and below the ground.
- Organisms live in and depend upon Montana's water streams.

Pre-Visit Discussion

We invite you to have a science discussion with your class before visiting Water to explore what ideas students will bring with them on the field trip. Below, we provide examples questions.

These topics will be explored at your field trip.

- What is an ecosystem?
- How have humans changed the shape of the river and landscape?
- What tools do scientists and researchers use to study the landscape and ecosystem?
- Grades K-2: What do animals need to survive? Do all animals need the same things, or do different animals need different things?
- Grades 3-5: Does the shape of the land always stay the same, or does it change over time? What might cause the shape of the land to change over time?
- Grades 6-8: How do rivers form? Are all rivers the same, or can rivers be different from each other? If they can be different, what are some examples of how rivers could differ from each other?
- Grades 9-12: What kinds of substances can be transported through the landscapes by water? How can different contaminants move with water?

Post-Visit Discussion

After visiting Water, we invite you to review the pre-visit discussion items.

- What did your students learn from their visit to Water?
- What was their favorite part of the exhibition?
- Are they interested in pursuing a career in geosciences?

Favorite Links

Check out these great websites to get more information about what ecosystem scientists in Montana are doing, ad about educational resources associated with their work!

Montanaioe.org | **Mtnsfepscor.org** | **Raptorview.org**